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Disciplines

Finance and Financial Management

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1 Introduction

One of the most salient trends in corporate debt markets in the past 10-15 years has been the increasing prevalence of callable bonds (see figure 1). In this paper we study and explain this increase. We find that this increase is driven primarily by a specific type of callable bond, in which the call option of the firm to repurchase the debt is almost never in the money (that is, the strike price of the option is almost always higher than the value of the bond.) With this in mind, we evaluate whether previous motives related to interest rate risk management, asymmetric information, or agency issues can explain the popularity of these bonds. We find that they cannot. Based on relatively new theories and evidence proposed by Mian and Santos (2011) and Xu (2016) and others, we suggest a new motivation for why these bonds occur. Specifically, we show that the presence of these “out of the money” options can help mitigate refinancing or rollover risk for the firm. We propose a simple model featuring this mechanism and use it to help explain several of the empirical patterns that we observe (and document) over the last decade.

While initially popular in the 1980s for interest rate management purposes, the usage of callable bonds declined significantly with the widespread availability of OTC derivatives in the early 1990s. Academic literature around that time suggested that the primary purpose of call options in debt were to help alleviate agency conflicts or problems of asymmetric information (see e.g. Crabbe and Helwege (1994)). In the late 1990s, the usage of callable bonds began to increase, and soon the majority of bonds issued by nonfinancial corporations contained call provisions. This trend has increased over time, to the point where over 90% of bonds issued by nonfinancial corporations in our sample contained call provisions in each of the last 5 years. This increase has occurred across almost all types of bonds and firms, although there are some cross-sectional differences, as we will discuss in Section 3.

An equally interesting element of this pattern is that the usage of the sorts of callable bonds that were popular in the 1980s peaked in 1999 and fell dramatically thereafter, representing less than 10% of the total par value of bonds issued in 2012-2014. Instead, this increase was driven by a different type of callable bond: the make-whole bond. While substantially similar in terms and structure to the callable bond, the make-whole bond contains one very important difference: the way that the strike price of the option is computed. In particular, the strike price is computed in such a way so as to almost never be below the market value of the bond. Thus, firms exercising the option on these bonds would almost always be doing so at strike prices that are “out of the money.” Figure 2 plots the trends in both make-whole bonds and non-make-whole callable bonds for the firms in our sample.

This important distinction has several implications. First, as we will show in Section 4, these make-whole provisions completely remove any interest rate motives for having an embedded call option. Moreover, the agency and asymmetric information stories that potentially explain why callable bonds were issued in the 1990s cannot explain the issuance of make-whole bonds. The structure of the strike prices precludes the manager/equityholders from having the proper incentives and several of their empirical predictions do not hold for the new class of make-whole bonds.

Since these theories do not hold for the new bond structures and are not well-supported by the new empirical evidence, we begin our proposal of a new theory of the issuance of make-whole debt by documenting a few novel stylized facts. First, we show that firms that are likely to have higher credit risk (as measured by income volatility or leverage) are more likely to issue make-whole bonds. Second, we show that, compared to the proceeds of other bonds, firms are more likely to use the proceeds of make-whole bonds for the purposes of investment. Based on these two facts, we propose a theory for the issuance of make-whole bonds where the primary reason that firms prefer bonds of this type is to avoid the potential for refinancing risk. This risk is a topic that has been explored in several other recent papers (e.g. Xu (2016)) and is highest for firms with high credit risk and who invest immediately and so face a potential mismatch between investment and debt maturity. We embed this refinancing risk in a simple model and show that make-whole bonds can help firms previously frozen out of credit markets access capital and allow other firms to borrow more.

This paper is related to several strands of literature. First, it draws upon the early reasons advanced for the usage of callable bonds by firms. One such reason is interest rate risk management by firms, which is discussed in Kraus (1973), building upon the work of Kalyman (1971) and Weingartner (1967), among others. Given that the motivation for interest rate risk management through bond options became somewhat moot with the introduction of OTC interest rate derivatives, new explanations were needed. Many of these centered around agency conflicts; Crabbe and Helwege (1994) gives an excellent overview of this. They identify three primary theories. The first is the problem of managers underinvesting if equityholders do not benefit from the returns, a problem identified by Myers (1977). Bodie and Taggart (1978) show that callable debt can help resolve this problem. Barnea, Haugen, and Senbet (1980) identify two further potential agency conflicts: the first stemming from asymmetric information (as also discussed in Myers and Majluf (1984)) and the second from risk-shifting on the part of managers. These theories will be discussed in more detail in Section 4. The empirical work testing these theories is also quite relevant as it helps identify testable predictions and testing methodologies. Thatcher (1985), Mitchell (1991) and Kish and Livingston (1992) were among the early works to test these hypotheses. More recently, Banko and Zhou (2010) and Guntay,

Prabhala, and Unal (2013) have tested some of these hypotheses. Our paper will differ from both groups in that we use the additional characteristic of the more recent bonds as make-whole to more rigorously test these hypotheses (and also in that we use a more comprehensive and newer set of data.)

After a thorough analysis of existing explanations for callable debt, we then propose our own explanation for the prevalence of make-whole bonds relying on the ideas of refinancing risk and maturity management. Although the idea of matching the maturities of assets and debt is a fairly well-established one (see e.g. Modigliani and Sutch (1966) and Myers (1977)), the idea of rollover risk impacting firm decisions is one that is only now gaining much attention. Recent paper such as Brunnermeier and Yogo (2009), Mian and Santos (2011), and Xu (2016) study this extensively. The last of these three, by discussing the impact of callable debt, is particularly related to this paper. This model also builds upon the more canonical models of debt dynamics, such as Leland and Toft (1996), although the structure is a bit different.

The next section will discuss precisely what the differences between make-whole and traditional callable debt are and present evidence on other forms of early refinancing. Section 3 then discusses the data used in the paper and presents several empirical trends, notably on the cross-sectional differences in debt issuance and on the use of proceeds from debt issuance, that will be useful in motivating the model. Following that, Section 4 builds upon Sections 2 and 3 by showing how previous explanations for the usage of callable debt run afoul of either the new institutional characteristics of make-whole debt or the more recent empirical trends. Section 5 presents an alternative model for make-whole debt relying upon incomplete capital markets, refinancing risk, and costs of financial distress. The results of this model are also presented in this section. Finally, Section 6 concludes.

2 Institutional Background

This section covers two important pieces of institutional background. The first subsection discusses the difference between traditional callable bonds and make-whole bonds and the second subsection reviews the other methods by which a firm may retire its debt early.

2.1 Callable and Make-Whole Bonds

The feature differentiating callable bonds from noncallable bonds is a call provision, which the issuer of the debt (in this case the firm) can exercise to repurchase its debt from bondholders. This call provision contains a number of important details. First, it specifies a window during which the bond may be called. This window may be from issuance until the maturity of the bond or only cover a subset of the time that

the bond is outstanding. Second, like a traditional call option, the call provision specifies a “strike price” at which the bond may be called. This is where the key difference between traditional callable and make-whole bonds comes, and so we examine it in further detail.¹

For purposes of our analysis, we consider two primary classes. The first is the case of traditional callable bonds, such as those that were issued throughout the 1980s. Nearly all callable debt issued until 1994 was of this form. These bonds specify a call price (expressed as a percentage of par) at which a firm may call the bond. This price is typically either fixed or varies with time (usually decreasing monotonically) over the length of the call window. Importantly, this is the only dimension along which the price can vary. That is, the path of the strike price of the call option requires depends only on the date. An example of a bond with this traditional call provision comes from Wells Fargo’s 17-year \$13.7 million notes issued on June 17, 2014, which state:

“The notes are redeemable by Wells Fargo, in whole or in part, on any interest payment date occurring on or after June 17, 2019 at 100% of their principal amount plus accrued and unpaid interest to, but excluding, the redemption date.”

The second class consists of make-whole bonds, which have a strike price structure that has one important change. For make-whole calls, the strike price is set to be the maximum of the par value (or some fixed percentage of the par value) and a proxy for the market value of the bond. This market value proxy is computed by taking the remaining interest and principal payments of the bond and discounting them at a fairly low interest rate, usually given by a benchmark Treasury rate plus some fairly low fixed spread. It is important to note that this fixed spread is usually set to be below whatever spread the firm could borrow at in the open market, even under the best conditions. An example of a bond with this provision is Coca Cola’s November 1, 2013 issue of four fixed rate bonds due in 2016, 2018, 2020, and 2023:

¹ There may be other features included in call provisions, including multiple tiers of calls which specify different prices for different date ranges of calls (and in some cases also restrict the number of bonds that can be called) and provisions which specify certain conditions under which a bond issuer may or may not call (these may be either firm specific or macroeconomic conditions,) but these are not highly prevalent. There does, however, exist some literature on firms optimally choosing call provisions to reduce agency costs, among other things (see e.g. Thatcher 2005.) We largely abstract away from these considerations.

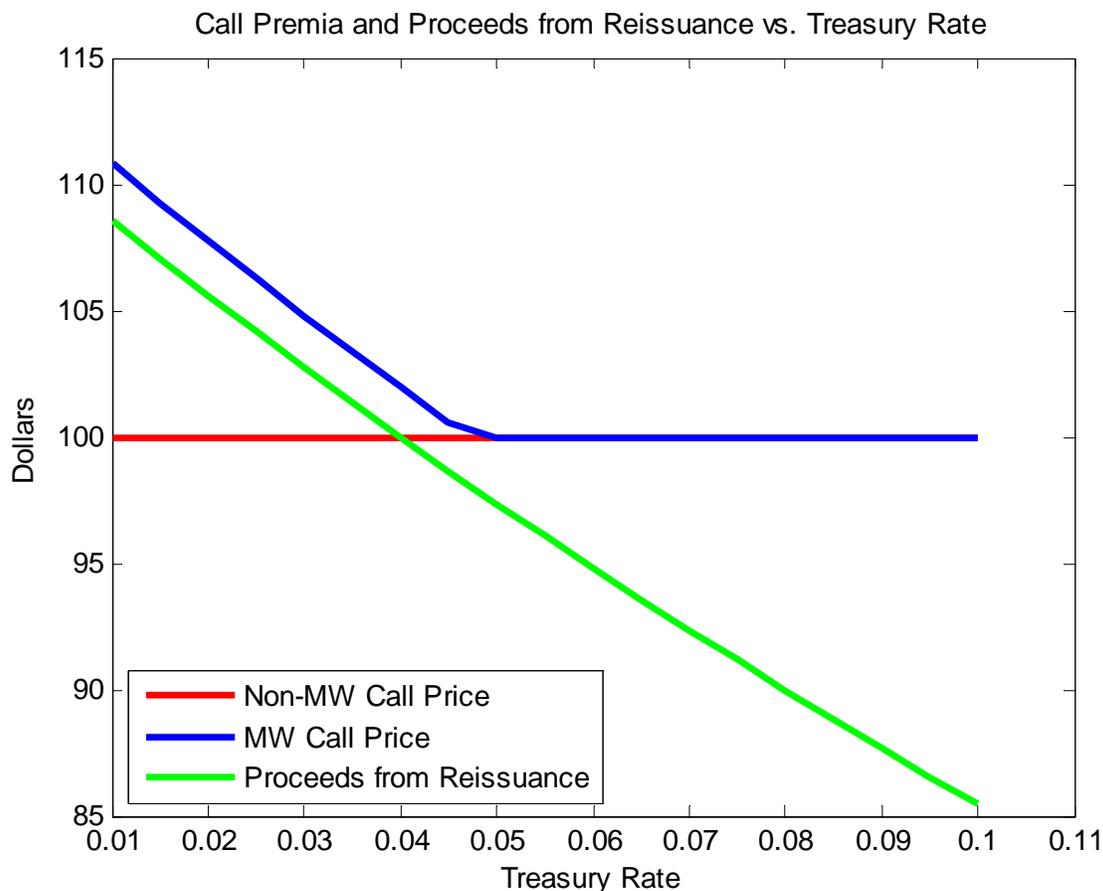
“We may redeem any series of fixed rate notes at our option and at any time, either as a whole or in part. If we elect to redeem a series of fixed rate notes, we will pay a redemption price equal to the greater of:

- 100% of the principal amount of the notes to be redeemed, plus accrued and unpaid interest; and
- the sum of the present values of the remaining scheduled payments, plus accrued and unpaid interest.

In determining the present value of the remaining scheduled payments, we will discount such payments to the redemption date on a semi-annual basis (assuming a 360-day year consisting of twelve 30-day months) using a discount rate equal to the Treasury rate plus 5 basis points for the 2016 notes, a discount rate equal to the Treasury rate plus 7 basis points for the 2018 notes, a discount rate equal to the Treasury rate plus 10 basis points for the 2020 notes and a discount rate equal to the Treasury rate plus 10 basis points for the 2023 notes.”

This has two immediate implications. First, it means that the strike price will vary not only with time but with market conditions. In particular, the strike price will be highest when Treasury rates are low (generally in good times) and will be lowest when Treasury rates are high. Hence, the strike price will be procyclical. This feature is designed to ensure that the calling of a bond does not expose bondholders to losses due to changes in the market interest rates over the lifetime of the bond. Second, because the fixed spread to Treasuries is set to be below the spread at which a firm could realistically refinance its debt, this price will virtually never be below the market value of the bond. Put another way, if the firm were to reissue a bond with the exact same interest payments and principal as the retired bond, it would almost certainly receive less than it would have to pay to call the identical make-whole bond. This has the effect, as alluded to earlier, of making this call option almost never “in the money” in the sense that the strike price for this call option will almost always be above the market value of the underlying asset (in this case the remaining payments of the bond.)

The following figure gives an example of this. Consider a firm that has issued a five year bond at par with annual coupon payments of 5.5% of the principal (\$100) and wants to refinance this bond at year two. Since we know that the make-whole fixed spread is usually far lower than the credit spread at which the firm is reissuing the bond, let’s assume that the credit spread at which the firm reissues is 150bps and that the fixed spread to the benchmark Treasury that the firm has to pay as stipulated in the make-whole provision is 30bps. The following plot gives the prices that the firm would have to pay to call a traditional bond (we assume that the call price is fixed to par) and a make-whole bond, as well as the proceeds that the firm would earn from reissuing a bond with exactly the same remaining payoffs as the retired bond. All lines are plotted versus the underlying Treasury rate.



Here, the firm profits by calling its debt and refinancing when the proceeds from reissuance (green line) exceed the price paid to call the debt (red line for traditional callable debt, blue line for make-whole debt.) Note also that this is a zero-sum game: any gain the firm makes by calling the debt below its true value is lost by the bondholder who has to surrender an asset for less than it is worth. Here we see that, for sufficiently low interest rates, the firm can profit if it has traditional callable debt by calling its debt at par and then reissuing debt with the same payments for a higher value. Upon closer inspection, one sees that once the Treasury rate drops below the coupon of the bond less the reissuance credit spread, calling debt at par becomes valuable for the firm. This is because the interest rate at which that payment is discounted (the Treasury rate +150bps credit spread) is lower than the coupon payment for Treasury rates less than 4%, meaning that the price of the bond is higher than par.

In contrast, it is never profitable for the firm to exercise the call option on make-whole debt and reissue its debt in this example since the credit spread at which it would have to reissue its debt is higher than the spread that it would have to pay to buy back its debt. This means that the discount rate that the firm

uses to value the payments that it buys back will be lower than those that will be used to value the debt that it issues and generate the proceeds for the firm. Thus, the make-whole call price will always exceed the proceeds from reissuance. Note also that since the make-whole call price is calculated as the maximum of the traditional call price and the proxy for market value, it will always result in a (weakly) higher payment by the firm.

These make-whole payment spreads are set such that they are almost always below the reissuance credit spread for a firm and thus the firm cannot benefit by calling its make-whole debt and reissuing a bond with the exact same payment structure. Indeed, for most of the bonds in the sample the make-whole spreads range between 5 and 50bps, far lower than the average issuance credit spread for bonds in the sample. Nevertheless, it is worthwhile to consider the extreme case in which the reissuance credit spread is actually lower than the make-whole spread. Figure 3 presents a graph identical to the one above, except that the reissuance credit spread is now 0bps. Note that, since the make-whole spread is so low, the firm still requires extremely low interest rates to be able to make even a slight profit by calling its make-whole debt and reissuing an identical bond.

2.2 Other Forms of Early Retirement

In addition to call provisions, there are two other mechanisms by which firms can retire debt early that are worth mentioning.

First, a firm can perform an open market repurchase. Transactions such as this are typically executed between two dealers, over the phone, with neither party knowing who the other party represents. For example, a firm may contact an investment bank, asking it to contact pension funds or insurance companies that hold its debt to buy the debt from them. The price is then privately negotiated between the two dealers. There are a couple of important points to note about transactions such as this. First, as noted in Levy and Shalev (2013), “corporate bond transactions [of this type] are relatively sparse.” In our complete data sample, open market repurchases constitute 3.57% of all early bond retirements. Second, given that this is done on a bondholder-by-bondholder basis, it is difficult to retire a significant fraction of the outstanding debt in this way. For the 5,579 open market repurchases in the data between 1986 and 2013, the average percentage of the debt issue retired is 24.1%. Further, in only 7% of these cases was the company able to retire all of its debt. This mechanism, is, however, fairly inexpensive. The average price paid by the company to retire its debt in this way is 95.23% of par.

The second additional mechanism that the firm has for retiring early its debt is a tender offer, in which it submits a written offer to bondholders informing them of the firm's desire to retire its debt early, and offering a price (typically a premium) at which the firm can buy back its debt from bondholders. Across the 5,694 tender offers from 1986 to 2013, firms tended to pay a significant premium in tender offers, as might be expected from the fact that they are signaling to bondholders that they wish to retire the debt. Several studies, such as Mann and Powers (2007) have cited asymmetric information as one potential reason for these high premia. The median price as a percentage of par paid by firms was 107%, however, there is significant positive skew to the tender price distribution. In fact, the 75th percentile of the tender price distribution exceeds the 98th percentile of the call price distribution. The majority of these offers tend to be fixed price, according to Kruse et. al. (2013), but they can also take the forms of fixed spreads or Dutch auctions. Tender offers are also a somewhat more effective way for the firm to retire a significant portion of its debt than open market repurchases. Across our sample, the average amount retired was 62.5% of the total debt issue (other studies have found even higher figures for far more limited early samples), and, in 13% of the cases, the firm was able to retire the entire debt issue.²

In order to synthesize all of this information, it is helpful to present the same statistics for callability. Partial and complete calls constituted 92.78% of the early redemptions in our largest data sample. On average, the calls retired 92.2% of the outstanding debt issue, and 91.2% of calls retired the entire debt issue. The average price paid for all calls was 99.23% of par, and the average price paid for make-whole calls was 104.21% of par. Calls also retire far more of debt issues than either alternative method, are more often in the data, and are subject to significantly lower transactions cost and legal fees. Compared to open market repurchases, 91.2% of calls retire the entire bond issue, while only 7% of repurchases do. Moreover, firms that issue callable or make-whole debt still have the option to perform either open market repurchases or tender offers as firms with noncallable debt would. For some firms, the difference in early redemption price between callable debt and noncallable debt is not high. For many, however, it is. Figure 4 illustrates this by plotting the price paid for early retirement of debt as a percent of par for three types of bonds: noncallable, traditional callable, and make-whole. We see that while the series are fairly similar for the bottom 30% of prices, the upper 30% of prices paid to retire noncallable debt far exceeds that paid to retire either form of callable debt. In fact, the make-whole premium looks fairly small compared to the additional premium one might have to pay to retire noncallable debt. In summary, if a firm expects that there is some chance that it will refinance its debt early, both callable and make-whole debt seem to offer far less risky and more cost-effective ways to do so.

²A third potential mechanism for early retirement is a sinking fund provision, which can enable a firm to repurchase some of its debt each year, but these provisions are uncommon and somewhat limited in scope.

3 Data and Empirical Trends

In this section we begin by describing the data sources employed and the methodologies used to trim the data. The second subsection then describes empirical results about the firms more likely to issue callable debt and the uses of the proceeds of such debt.

3.1 Data Sources and Methodologies

Two main sources of data were used for this project. The first is the Mergent FISD fixed income database, which provides bond information. This database contains several datasets that were useful for this project, among them the Bonds Issues Dataset, the Amount Outstanding Dataset, and the Redemption Dataset. The Bond Issues dataset contains bond-specific information for over 350,000 bond offerings between 1986 and 2014. In particular, this dataset was used to gather information such as bond par values, yields, maturity, coupons, issue dates, callability, and other options. The dataset also provides identifying information about bonds and their issuers, such as the issue CUSIP, issuer CUSIP, the industry of the issuer, and FISD-specific identification codes for both bond and issuer. One variable not included in this dataset is whether a bond is make-whole, and for this the FISD redemption dataset was used. After merging the Redemption dataset with the Bond Issues dataset, 193,776 observations remained. These observations were filtered to focus on U.S. corporate bonds issued by nonfinancial firms, and were then filtered to exclude certain uncommon options and features, such as fungibility, convertibility, lease obligation issues, etc., resulting in a final dataset of 20,166 bonds.³

For each of these bonds, FISD's Amount Outstanding dataset provides detailed descriptions of the instances where the amount outstanding of each debt issue potentially changed. It begins with the issuance of the debt and ends with the maturity or early retirement of the debt, and seems to be the most complete source of bond calls, open market repurchases, and tender offers. For each action, the dataset identifies the relevant issue, the type and date of the action, and the amount outstanding both before and after the transaction, as well as the price of the transaction, expressed as a percentage of the issue's par value. For the data in our sample, this dataset contained between 2 and 8 actions for each bond issue. We merged this and the other FISD datasets using the bond-specific issue id, which uniquely identifies each bond issue. The final dataset has just over 100,000 action-level observations.

This bond data was supplemented with the second main source of data for this project: firm data from

³More details about the exact bond features excluded and included are available upon request.

Compustat. For this we used the Quarterly and Annual Fundamentals datasets to obtain over 50 firm-specific variables, primarily balance sheet and income statement data. Among the most important of these were measures of asset, debt, and equity levels, debt flows, dividend policies, investment flows, M&A activity, interest payments, and revenue/net income figures. We then merged this Compustat data with the combined FISD data by matching either the CUSIP values, the company tickers, or the first five CUSIP digits and the company ticker. After conducting all of these merges, we then compared the results across merge categories, finding no significant differences in variables after using a relevant Holm correction for our .05 alpha level and the number of pairwise tests.

3.2 Empirical Trends

The purpose of this section is to establish two stylized facts that will be important in motivating the model in Section 5. The first fact is that firms with more credit risk are more likely to use callable debt (of all forms.) Second, we show that the usage of callable debt is closely tied to firm investment policies. Specifically, callable debt (and in particular make-whole callable debt) is more likely to be issued to fund future investment. We show these two facts by examining both the types of firms issuing callable debt and the use of the proceeds from debt issuance.

We begin by examining the cross-sectional characteristics of the firms issuing callable debt. Since over 90% of bonds in our sample in recent years have been callable, we consider the trends in callability over time of firms with different characteristics. Using this, we can draw inferences from both the rate of adoption of call provisions and the overall level of the prevalence of callable bonds.

The first cross-sectional characteristic that we consider is a firm's credit risk. There are many different measures that one could use for this, but we choose the S&P Long-term Issuer Credit Rating as a reasonable summary statistic of all of the factors that impact the creditworthiness of a company. Similar results also hold if one uses leverage or the volatility of earnings. For this analysis, we use the merged Compustat-FISD datasets and sort firms based on their credit ratings. We then separate bond issuances based on the credit ratings of the firm issuing them at the time of issuance, and consider how the trends in callability have varied across these firm credit ratings. Figure 5 displays the results. We see quite clearly that firms with lower credit ratings have always had a higher level of callability in their bonds, and that they were faster to adopt call provisions, and that this trend holds across all three groups considered. In summary, it seems evident that credit risk and the inclusion of a call provision are positively related: the higher a firm's credit risk, the more likely it is to include a call provision in its bond. This trend holds for make-whole bonds as well,

which can also be seen by the fact that the increase in callable bonds in recent years is driven almost solely by make-whole bonds.

The second fact that we hope to show is that investment and the inclusion of call provisions are directly linked. We do this by showing two relationships. First, firms that invest more tend to issue more callable debt. Second, firms that issue callable bonds (in particular make-whole callable bonds) are more likely to use the proceeds of their bond issuance for investment.

We begin by considering again the trends in callability across different levels of firm investment. We measure investment here by firm capital expenditures⁴ and perform a similar sorting exercise to that done previously. Namely, we pair bonds to matched annual capital expenditure to operating income ratios for the firms issuing those bonds, and then sort those observations into quartiles based on the ratio in each year (so as not to pick up the effect of average ratios changing over time). We then plot the trends in the prevalence of call provisions for each investment quartile in Figure 6. We see that firms in the lowest quartile of investment issue a lower fraction of their bonds as callable: in recent years this level has been roughly 20% less. Furthermore, it seems that these firms are more responsive to market conditions in their callability. While firms with higher levels of investment maintain a high fraction of callable bonds across market conditions, firms with lower levels of investment are more likely to decrease their usage of call provisions in bad times, such as the recent financial crisis. Again, this trend holds for make-whole bonds in particular.

The final form of evidence for the link between investment and the issuance of callable bonds comes from studying how firms use the proceeds of bond issuance. For this we consider a slightly different test. Since our outcome variable is now continuous on a firm-by-firm basis, we perform a fixed-effects regression of the post-issuance level of firm accounting variables on their pre-issuance level and a dummy for whether the bond issue was a make-whole callable bond. (We can use make-whole callable bonds now since we are not merely considering the trend over a few years.) Table 1 displays the results. We see that, relative to non-make-whole bond issues, issuers of make whole bonds use less of the proceeds for cash and dividends and far more for investment into property, plant, and equipment. This again demonstrates the link between callable bonds and investment: firms that issue callable bonds, in particular make-whole callable bonds, are those firms who have tended to invest a higher fraction of their income and who tend to use more of their proceeds for investment.

⁴R&D/intangible capital not included due to a lack of reliable data

Thus, this section has demonstrated two empirical facts. First, firms with lower credit ratings (more credit risk) are more likely to issue callable bonds. Second, firms that invest more and that are more prone to use their bond proceeds for investment are more likely to issue callable debt. These facts will help motivate the model in Section 5.

4 Analysis of Previous Explanations

Before beginning with our model, we briefly explore previous explanations for the issuance of callable debt and show why these explanations cannot rationalize the current trend. We explore four theories: asymmetric information, risk shifting, underinvestment, and interest rate risk management.

4.1 Asymmetric Information

The first theory concerns asymmetric information. As suggested in Barnea, Haugen, and Senbet (1980) (BHS), managers may have more information than is available to public investors (in particular bondholders.) If this is the case, managers with positive private information who issue non-callable bonds prior to the revelation of the information will be sharing the surplus of the revelation of that information with bondholders. This is because the revelation of that positive information will presumably reduce the default risk of the firm (or more generally improve its creditworthiness), increasing the value of its bonds. Existing bondholders will realize all of this benefit while managers and equityholders will not benefit from the appreciation in value of the bonds.

BHS suggest a solution to this problem in the form of callable debt. Since the call option is held by equityholders will appreciate in value by the same magnitude as the bonds, this security will appropriately compensate equityholders for the revelation of positive information. Just as bondholders undervalue the firm's creditworthiness (relative to the full information case), they also undervalue the call option by the same amount and so equityholders are appropriately compensated.

While this may be true for an at-the money call option where the delta of the option is approximately one, it is certainly not the case for make-whole debt, and therein lies the issue when one applies this theory to the current trend. As stated previously, the options on make-whole bonds are structured so that they are almost never in the money. Since the strike price contains such a low spread to the benchmark Treasury, the firm's credit profile would have to improve enormously for the value of the underlying bond to exceed the

strike price. This means that the option is initially deeply out of the money, and, as such, has a delta far below one. So, even if the firm's credit profile were to improve, the value of the option would not increase by the same value of the bond, and, in fact, would hardly increase at all. Since these options are virtually never in the money, their value would remain close to zero over the life of the bond and even revelations of positive information are not likely to change that. As such, equityholders will receive very little compensation for their private information.

What this implies is that equityholders with private information will be poorly served by seeking to mitigate this wealth transfer by issuing make-whole callable debt. There are a number of alternate solutions, including shorter maturity debt, convertible debt, and bonds with call options that are not make-whole. But clearly, the increase in the issue of make-whole bonds cannot be rationalized by managers seeking to ensure that equityholders are compensated for their private information.

4.2 Risk Shifting

A second issue identified by BHS that may motivate the issue of callable bonds is risk shifting. The idea is that after issuing noncallable debt, equityholders' claims on the firm's assets will be subordinate to a higher fixed claim by bondholders. The "call option" that equityholders hold on the value of the firm has a higher strike price as more debt is issued. In maximizing the value of the firm to equityholders, therefore, managers may be incentivized to take on riskier projects. If debtholders expect this action ex-ante, then it will naturally reduce the price that they pay for debt when it is issued. The conflict here comes from the fact that taking on such risky projects reduces value for bondholders while increasing it for equityholders. One potential solution to this proposed by BHS, then, is to issue callable debt. Since the bond value decreases with the adoption of these projects, the value of the call options held by the equityholders will decrease, and this will act to temper any incentives that equityholders have to take on these projects.

In discussing this solution, Crabbe and Helwege identify a key element to eliminating the conflict: "To eliminate the incentive to increase risk, a firm will include a call option whose value equals the potential gain from switching investments" (page 5). While this may be possible for non-make-whole callable debt, it is certainly not possible given the typical structure of make-whole issues, for similar reasons as discussed above. In particular, since the call options in make-whole issues are almost always significantly out of the money, the value of those options is not likely to change much based on firm investments. Since the value starts out very low for the vast majority of these issues, the adoption of risky, low-NPV projects by the firm

cannot decrease the value by much and so will not act as an effective counterweight to the incentives for equityholders to increase the riskiness of the firm's value.

Clearly then, this motive cannot explain the recent increase in make-whole debt. Additionally, as Crabbe and Helwege observe, this theory would also imply that riskier firms should issue bonds of lower maturities, but this appears empirically to not be the case. For example, Xu (2016) shows that the average maturity of speculative-grade bond issues is significantly lower than that of investment-grade bond issues.

4.3 Underinvestment

The third agency theory that we consider is the underinvestment problem proposed by Myers (1977). This problem arises when managers, after issuing debt, receive an investment opportunity that is likely to only provide a payoff to bondholders. An example of this, discussed in Bodie and Taggart (1978) is a firm that has nontrivial default risk receiving news of a fairly safe project that provides a fairly low payoff. Managers seeking to maximize shareholder wealth would then prefer not to make this investment, saving their capital for projects that can potentially benefit equityholders. As with the previous case, this will reduce the ex-ante price paid for the debt by bondholders.

The solution proposed by Bodie and Taggart is the embedding of call options in these bonds. The call options alleviate this problem by allowing the firm to recontract based on the new project/investment and thus allowing equityholders to be compensated for the adoption of this project. While this may hold for traditional callable bonds, it fails with make-whole bonds. This is because even with the revelation of a new investment project beneficial to bondholders, the option embedded in a make-whole bond is still highly unlikely to be in the money. The spreads to benchmark Treasuries that characterize the strike price of the option are so low that the bond would need to be extremely close to risk-free for this to occur. Given that this problem is most acute for firms with significant default probabilities, such a transformation is wholly unlikely. Furthermore, given that there are several other mechanisms by which firms can mitigate this conflict (for example shorter maturity bonds), this hypothesis also cannot explain the risk of make-whole bonds.

4.4 Interest Rate Risk Management

The last explanation for the usage of callable debt that we consider is interest rate risk management. Although proponents of this justification have decreased over time, it is simple to show that make-whole bonds do not offer any interest rate hedges for firms. The idea behind this hypothesis is that firms that issue

bonds at a high interest rate may seek to refinance at a lower rate, benefiting from the reduction in interest payments. Bonds with traditional call options enable firms to do this by allowing them to repurchase their debt at its par value and issue debt at the prevailing (lower) market interest rate. Kraus (1973) showed that this is a zero-sum game and hence should be priced equally by both parties (assuming the same stochastic discount factor) and the widespread use of OTC derivatives by corporations seems to have eliminated the need for this.

Even more strongly, note that make-whole bonds do not help firms manage interest rates. Since the call price paid by the firm reflects the prevailing market interest rate, firms that issue bonds at high interest rates and seek to refinance at low interest rates will be forced to pay at least the market price of the bond, and thus will at best earn no profits. The graph and subsequent explanation in Section 2.1 illustrate this point. Clearly then, the motive of hedging interest rate movements cannot be behind the increase in make-whole bonds.

We have thus seen that several of the most popular explanations for why firms issue callable bonds fail to explain the recent increase in make-whole callable debt. The asymmetric information and underinvestment hypotheses both require managers to be potentially interested in exercising the call option to recontract, something which is highly unlikely given the structure of make-whole call options. The risk shifting motive requires the option to be priced such that its sensitivity to price decreases in the underlying bond is relatively high, which is again improbable since the option is deeply out of the money at issuance. The predictions of this theory regarding the interaction of cash flow riskiness and debt maturity also seem to contradict recent empirical evidence. Finally, the interest rate risk management story cannot rationalize make-whole bonds almost by construction: the make-whole option is designed to insure bondholders against the risk of changes in market interest rates, not firms.

5 Model and Results

It thus seems that we need a new theory to explain why firms have been increasingly issuing make-whole debt. We propose that theory in this section, beginning by motivating it and providing some background in the first subsection. The second subsection explains the mechanism of the model and the third presents results of the discrete model. We extend this model to a fully dynamic infinite-horizon model in subsection four.

5.1 Motivation

The main idea behind our model is refinancing risk. Put simply, firms realize that at the time at which they refinance their debt, the availability of credit and the credit spread they pay is determined based on credit market conditions at that time. If firms wait until their debt matures to reissue, then they are forced to either be subject to the prevailing credit market conditions or seek other forms of financing, both of which can be costly. In seeking to avoid these costs, firms may prefer to have a choice of refinancing dates on or before the maturity of their debt issues. Make-whole debt allows firms to do this. This hypothesis is consistent not only with the empirical trends that we documented, but also with the results that others have found—both theoretical and empirical. We begin with a bit of background of refinancing risk.

There has been significant work showing that refinancing during tight credit markets can be costly to firms. Firms may have to refinance at significantly higher interest rates (Froot et. al. 1993) or worse bond terms (He and Xiong 2012). If financing is in short supply or altogether unavailable, firms may be forced to liquidate excessively by creditors (Diamond 1991), sell assets in a firm sale (Choi et. al. 2013) or decrease investment (Almeida 2009). Of course, firms may also be forced to default (He and Xiong 2012). Moreover, this seems to be a concern that both firms and financiers recognize. Graham and Harvey (2001) show that CFOs claim they manage debt maturity to “reduce risk of having to borrow in bad times,” while credit rating agencies commonly cite refinancing risk as a reason to downgrade firms (and the refinancing of debt as a reason to upgrade firms.) A concrete example can be found in Bank of America Merrill Lynch’s 2012 advice to CFOs:

“Don’t wait too long to refinance upcoming maturities. Give yourself at least 18 months before your current financing matures, so that if any segment of the market ... shuts down for a few months, you’ll still have time to get something done when the markets inevitably return to life”

Bank of America cites that advice as being one of the “lessons from the financial crisis”, and indeed this is a risk that is naturally heightened by financial crises and observed credit market freezes. In the model we will tie this refinancing risk to the issuance of make-whole debt, and we note that the fact that the issuance of make-whole debt began to increase significantly during the financial crisis is one piece of evidence that this link is valid. Another comes in the cross-sectional characteristics of the make-whole bond issuers. In Section 3.2 we observed that firms with higher credit risk are those that issue make-whole debt at a higher rate, and these are precisely the firms that are more likely to be affected by refinancing risk, since their credit spreads are more countercyclical and their probability of accessing the credit market more procyclical. In addition, these firms tend to be more constrained in the debt maturities that they can issue, as Xu (2016)

shows. The other trend that we observed in Section 3.2 is that the issuance of make-whole debt and your investment policies are closely linked: firms that invest more of their earnings tend to be more likely to issue make-whole debt. This too is evidence for the refinancing risk explanation: refinancing risk is highest when a firm requires a steady stream of income. If the firm can vary its assets side with variations in its liabilities, refinancing risk is not as large of a concern. Of course, capital investment is one of the more irreversible forms of capital (see for instance Ramey and Shapiro (2001)). Thus, firms with heavier investment policies are likely to have assets that are harder to adjust downwards in level and thus are likely to be more sensitive to refinancing risk.

It is also worth mentioning the several papers that have been devoted to showing this refinancing risk directly. These include Mian and Santos (2011) and Julio (2013), but perhaps the most relevant is Xu (2016). Xu shows that speculative grade firms “frequently refinance early to extend the maturity of their outstanding bonds, particularly under accomodating credit supply conditions” and concludes that “the evidence is consistent with precautionary maturity management, in which speculative-grade firms extend maturity to hedge against refinancing risk caused by credit supply fluctuations.”⁵

5.2 Model Setup

We now propose a simple model to capture this refinancing risk effect and examine the impact of (make-whole) callable debt. The model features four periods and firms who invest in the first period. The firms finance this investment through their own initial equity and by issuing debt of one of two forms: non-callable or make-whole. That is, they cannot raise additional equity and we do not consider the choice between traditional callable and make-whole. Firms are subject to idiosyncratic productivity shocks which determine the return from their investments. The key friction in the model comes in the timing of investment and financing: firms are constrained to issue at most two-period debt, but their investment takes either two or three periods to mature. Liquidating investment before maturity is inefficient, so firms are incentivized to refinance their debt if their investment takes three periods (which they learn in the period following investment). In this case, a firm that issued traditional callable debt has to refinance at maturity of its debt (period 2), whereas a firm that issued make-whole debt can refinance in either periods 1 or 2. We will see that this expands access to credit markets and affects the optimal capital choice for these firms.

⁵One may ask whether non-make-whole callable debt can also achieve the purpose of mitigating refinancing risk. While it does suffice for that purpose, it pairs this safety with what is essentially an interest rate swaption for the firm’s borrowing rate, which may distort incentives to call when the goal is to reduce refinancing risk. Make-whole debt allows bond issuers to more precisely specify the cost of insurance for this risk and, perhaps for this reason, has become the prevailing form of callable debt issued by US nonfinancial corporations.

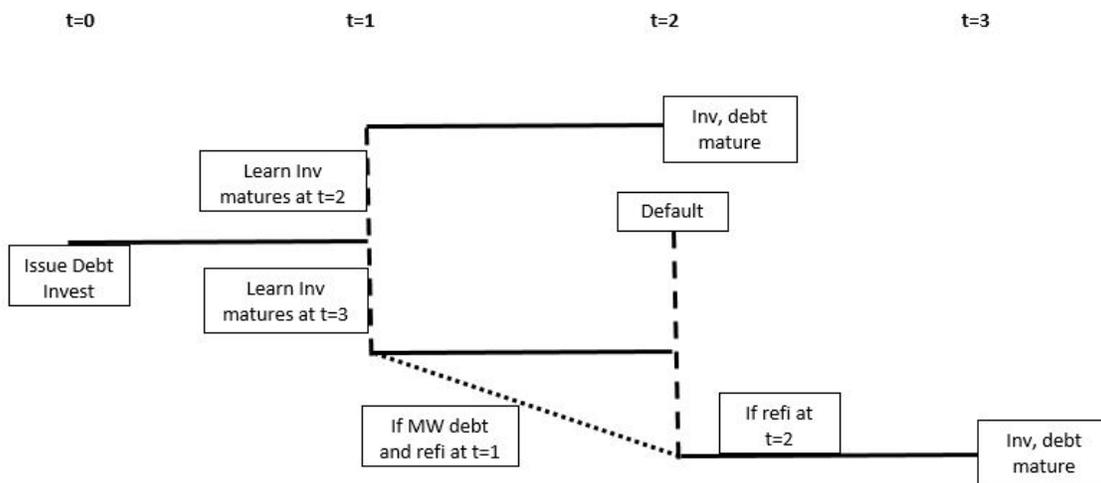
Firms begin with an initial amount of equity E_0 that is held in cash and an opportunity at the initial time period to invest capital k_0 in a technology yielding $y_t(k_0) = Z_t k_0 - \alpha k_0^2$. Z_t represents the firm's idiosyncratic productivity, and its log follows an AR(1) process:

$$z_{t+1} = (1 - \rho)\mu_z + \rho z_t + \sigma_z \epsilon_{t+1}$$

where ϵ_{t+1} is drawn from a standard normal distribution. The returns from this technology materialize at $t=3$ with probability p and at $t=2$ with probability $1 - p$. To finance this capital k_0 , firms issue 2-period debt D_0 at time 0 maturing in time 2. They have two choices for this debt: non-callable debt, which must be refinanced in period 2, and make-whole debt, which can be refinanced in either period 1 or period 2. We denote the respective interest rates for non-callable and make-whole bonds as r_0^{NC} and r_0^{MW} . Debt is fairly priced, and both firms and bondholders use a constant discount factor β .

The firm learns in period 1 whether its investment returns will be realized in period 2 or period 3. If the investment matures in period 2, then the initial maturity of its debt and the maturity of its investment match, and the firm does not need to refinance its debt. However, if the investment matures in period 3, the firm will need to obtain funding between periods 2 and 3, which requires it to refinance its debt. If the firm is unable to do so, it is forced to default and its salvage value becomes ψk_0 . The following diagram illustrates the timing of events in the model:

The following diagram illustrates the timing of events in the model:



Note that the firm has no incentive to issue make-whole debt when it refinances since the flexibility in refinancing date is of no value to it once it knows its investment maturity and can issue debt with the same maturity. Thus we can denote the interest rate at which the firm refinances as r_t^{NC} where either $t=1$ or $t=2$ depending on the date of refinancing. Also note that the firm prefers to use its costless initial equity first, then finance any further investment with debt. Thus, given a level of investment, the amount that it borrows can be written as $D_0 = \max\{0, k_0 - E_0\}$. Given this, we can write the firm's value if it issues non-callable debt as follows:

$$V_0^{NC} = \max_{k_0} E \left[p \beta^3 \max \left\{ y_3(k_0) - D_0 (1 + r_0^{NC})^2 (1 + r_2^{NC}), 0 \right\} 1_{\{refi\}} + (1-p) \beta^2 \max \left\{ y_2(k_0) - D_0 (1 + r_0^{NC})^2, 0 \right\} \right]$$

where the first term represents the value if the investment takes three periods to mature and the firm is able to refinance and the second term represents the value if the investment takes two periods to mature. Similarly, the firm's value if it issues make-whole debt is given by:

$$\begin{aligned} V_0^{MW} = & \max_{k_0} E \left[p \beta^3 \max \left\{ y_3(k_0) - D_0 (1 + r_0^{MW})^2 (1 + r_2^{NC}) - MWpre, 0 \right\} 1_{\{refi@t=2\}} + \right. \\ & \max \left\{ y_2(k_0) - D_0 (1 + r_0^{MW}) (1 + r_2^{NC})^2 - MWpre, 0 \right\} 1_{\{refi@t=1\}} + \\ & \left. (1-p) \beta^2 \max \left\{ y_2(k_0) - D_0 (1 + r_0^{MW})^2, 0 \right\} \right] \end{aligned}$$

where the first term represents the value if the investment takes three periods to mature and the firm refinances in the second period, the second term represents the value if the investment takes three periods to mature and the firm refinances in the first period, and the third term represents the value if the investment takes two periods to mature (in which case the firm does not need to refinance its debt).

Thus the firm will optimally choose both its level of borrowing (and hence its level of investment) and its type of borrowing. We will see that the choice of the latter can be quite important in terms of the firm's access to credit markets and the price it pays for that access.

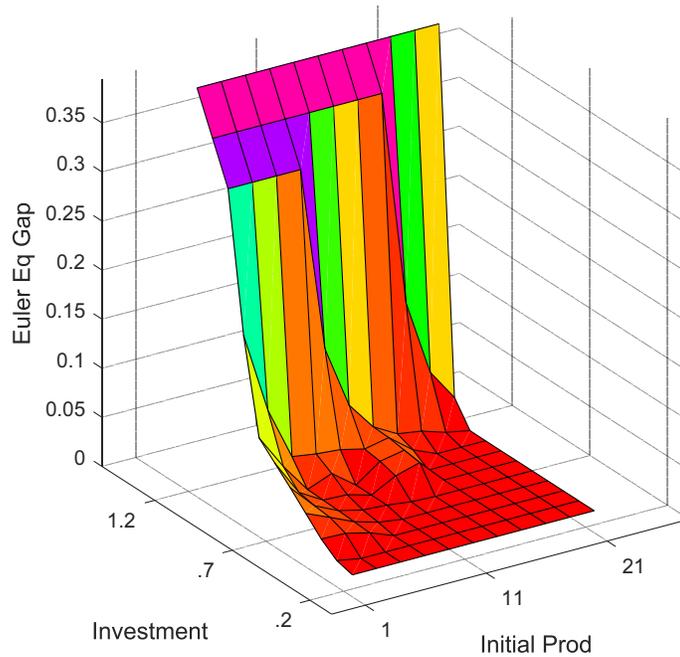
5.3 Results

There are two key results from this model. First, we show that having access to make-whole debt can increase a firm's access to capital. In particular, refinancing risk can lead to a firm being frozen out of time-0 credit markets if it attempts to issue non-callable debt. By allowing the firm to refinance in two different periods,

make-whole debt reduces the refinancing risk faced by the firm and so can alleviate market shutdowns in time 0. Second, make-whole debt increases access to capital: firms can generally issue more debt as make-whole than otherwise.

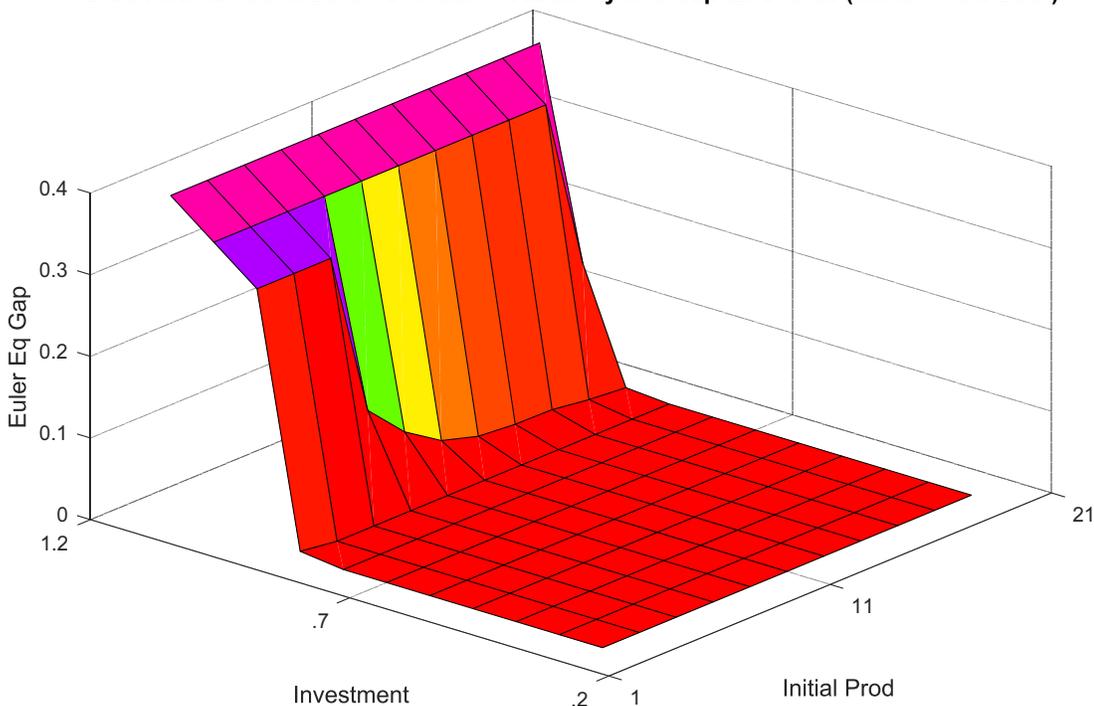
We demonstrate these effects by considering whether a firm with a given set of parameters will be able to access credit markets for each type of debt. The outcome variable here is how open or closed the credit market is, which is measured by whether the Euler equation for bondholders can be satisfied for some interest rate and, if not, the minimal gap across interest rates. Thus a value of zero corresponds to open credit markets, while larger figures correspond to credit markets that are farther from being open. We first fix the underlying productivity process and consider how access to credit markets varies with a firm's initial productivity state (on a scale of 1-21) and the amount of capital the firm is seeking to invest. The following plots illustrate the credit market outcomes⁶:

Credit Market Conditions vs. Initial Productivity and Capital Choice (Non-Callable Debt)



⁶These results based on $\mu_z = .04$, $\rho_z = .5$, $\sigma_z = .025$, $E_0 = .1$, $\beta = .99$, $\alpha = .2$, $\psi = .6$, $p = 1$, $MWpreM = .5 * \left(r_0^{MW} - \left(\frac{1}{\beta} - 1 \right) \right)$.

Credit Market Conditions vs. Initial Productivity and Capital Choice (Make-Whole Debt)



The top plot concerns non-callable debt while the bottom plot presents results for make-whole debt. For each plot, the x-axis represents the firm's initial productivity level (on a 21-point grid). Higher numbers here correspond to higher initial productivity levels (which correspond, in turn, to reduced credit risk.) The y-axis plots the level of investment, k_0 , that the firm wishes to undertake. This investment is directly linked to the amount of debt that firms issue since they will fund investment first with their limited initial equity, and then by issuing debt. Lastly, the z-axis gives a measure of how open or closed credit markets are. Specifically, it plots the minimal gap in the Euler equation across all interest rates for debt of a specific amount and for a specific firm. Levels of zero correspond to the firm being able to access credit markets and borrow that amount, while levels above zero imply that there is no interest rate satisfying the bondholder's Euler equation. In the latter case, the magnitude of the variable on the z-axis indicates just how significant the credit shutdown is: it gives a measure of the dollar transfer that the lender would need to make the loan.

Thus we see that access to make-whole bonds has two significant effects. First, for a given level of investment, poorer-quality firms gain access to credit by issuing make-whole bonds whereas they otherwise would not be able to access credit markets through non-callable debt. For investment levels near the middle

of the distribution, only about the top half of firms (in terms of initial productivity) have access to credit market through non-callable bonds, whereas all firms can access credit markets through make-whole bonds. We see that this effect is greater for firms with lower initial productivity levels, corresponding to the empirical pattern that firms with lower credit ratings are more likely to issue make-whole debt. Second, for a given level of initial productivity, firms can borrow far more with make-whole debt than they would be able to with non-callable debt. For firms in the middle of the productivity distribution, make-whole bonds allow them to borrow roughly twice as much as non-callable bonds. This also matches the empirical evidence that issuance of make-whole debt and high-investment policies tend to be significantly linked.

5.4 Full Model

We now extend this model to an infinite-horizon setting in which firms dynamically choose their refinancing policy. Investment, as in the previous model, takes place entirely in the first period. Firms finance their investment first with initial equity and then with one of four instruments: one-period debt, two-period noncallable debt, two-period make-whole debt, and additional equity. The projects have stochastic maturity where the completion date of the project follows an exponential distribution with parameter λ . Firms need to maintain their initial source of funding until their project matures, at which point they realize cash flows from the project, pay financing costs, and distribute the rest of the proceeds to initial equityholders. As before, firms are subject to idiosyncratic productivity shocks and both equityholders and bondholders discount cash flows at a constant discount factor β .

Note as before that refinancing risk here comes from both the stochastic maturity of the project and the time-varying firm conditions. The firm is required to maintain its source of financing until a realization of the project maturity, but in the meanwhile its idiosyncratic productivity independently fluctuates. Moreover, as time passes, interest accumulates on debt that the firm has borrowed, thus requiring the firm to finance increasingly large amounts to continue the project. (This is one significant sense in which there is time dependence in this problem and it cannot be thought of as a series of static problems; another is the autocorrelation of the productivity shock.)

Comparing the forms of financing, we see that they have very different implications for refinancing risk and firm value. Additional equity never needs to be refinanced, but is subject to issuance costs and does not feature the interest rate tax shield. One period debt must be refinanced every period and two period noncallable debt must be refinanced every other period (in the absence of a project maturity.) Two period make-whole debt may be refinanced either one or two periods after issuance. The firm will optimally choose

to refinance one period after issuance if credit markets are open (i.e. there is no gap in the Euler condition) and equity value is maximized compared to waiting. It is important to keep in mind that it is not always optimal for the firm to refinance in the period following issuance as it will likely pay a higher interest rate (it will be refinancing at a higher leverage).

The payoffs in each state largely follow from the previous model, and the time-0 value functions can be written in simplified form as follows (the time-t value functions are identical but for the optimization over the capital stock):

For a firm issuing one-period debt:

$$V_0^{one} = \max_{k_0} E [\lambda\beta(\text{payoff from project maturing next pd}) + (1 - \lambda)\beta 1_{\{refi\}} V_1^{one}]$$

For a firm issuing two-period noncallable debt:

$$\max_{k_0} E [\lambda\beta(\text{payoff from project maturing next pd}) + \lambda(1 - \lambda)\beta^2(\text{payoff from project maturing in two pds}) + (1 - \lambda)^2\beta^2 1_{\{refi\}} V_2^{two,nc}] = V_0^{two,nc}$$

For a firm issuing two-period make-whole debt:

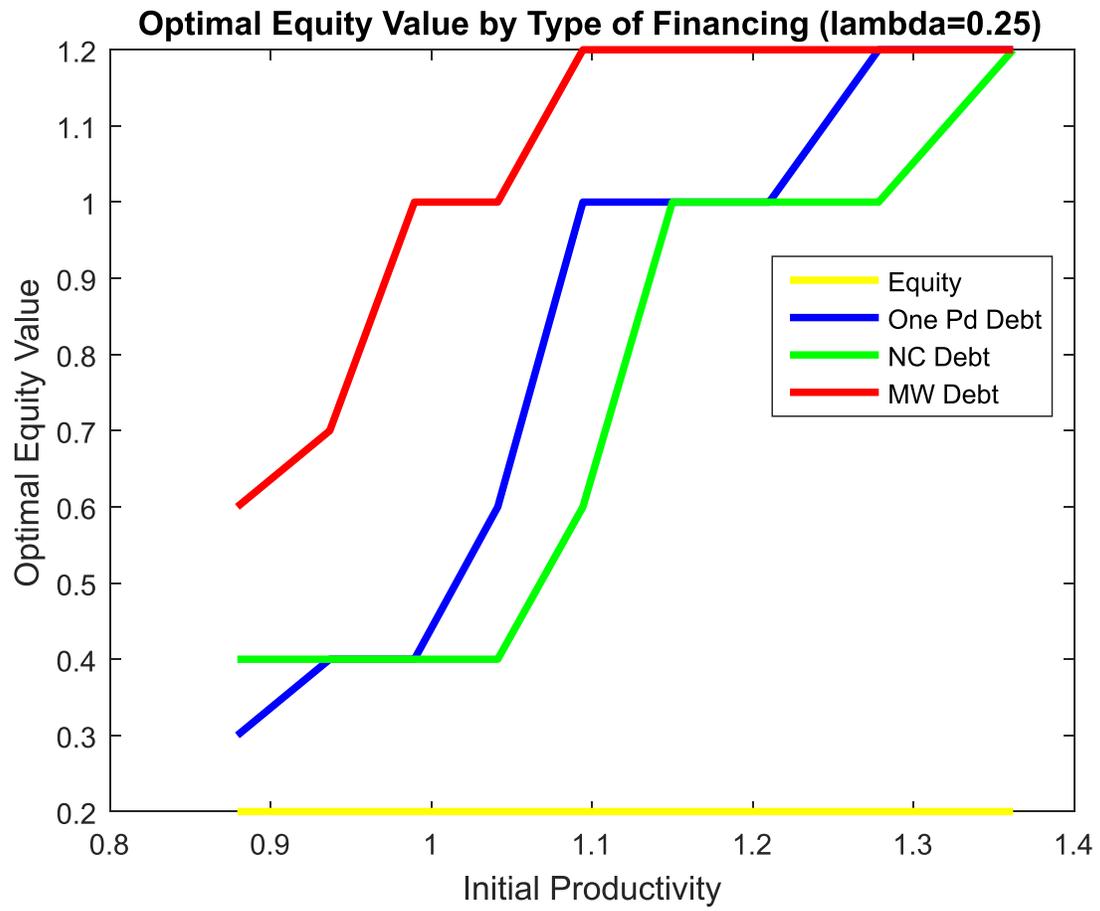
$$V_0^{two,mw} = \max_{k_0} E \{ \lambda\beta(\text{payoff from project maturing next pd}) + (1 - \lambda)\beta 1_{\{refi \text{ in } 1\}} V_1^{two,mw} + \lambda(1 - \lambda)(1 - 1_{\{refi \text{ in } 1\}})\beta^2(\text{payoff from project maturing in two pds}) + (1 - \lambda)^2\beta^2 1_{\{refi \text{ in } 2\}} V_2^{two,mw} \}$$

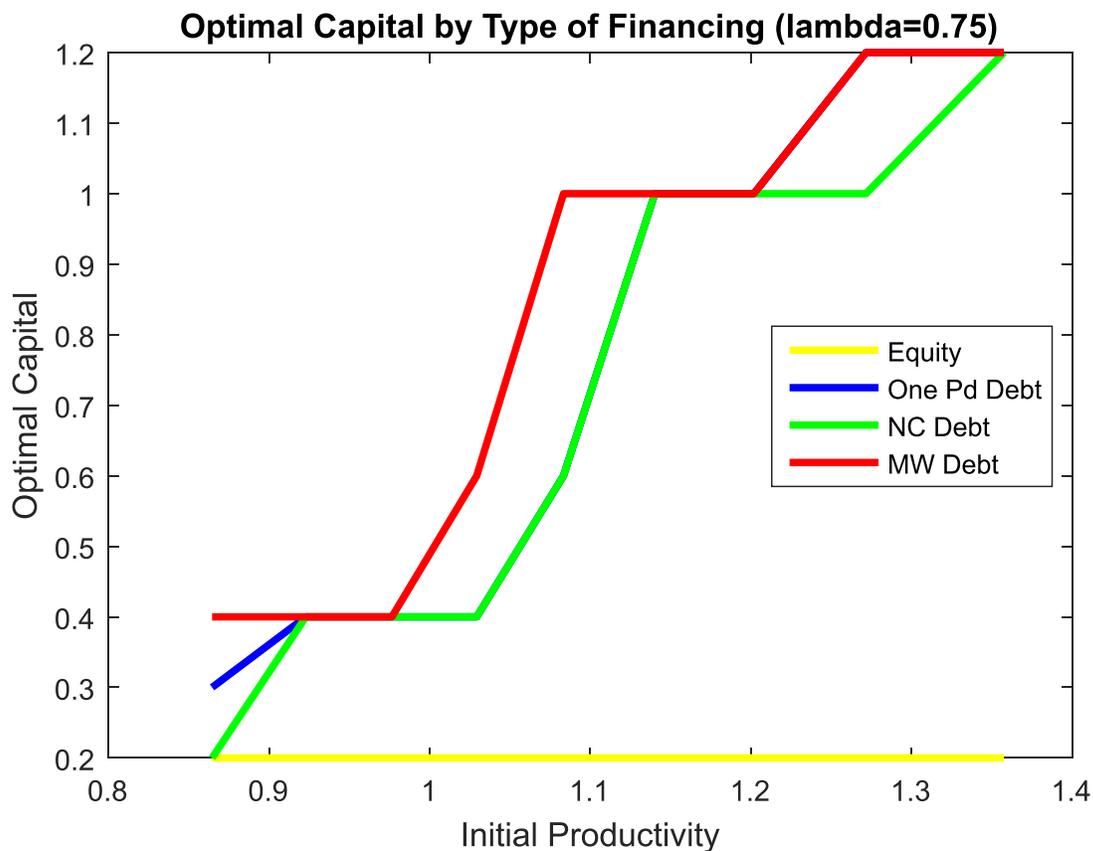
For a firm issuing additional equity:

$$V_0^e = \max_{k_0} E [\lambda\beta(\text{payoff from project maturing next pd}) + (1 - \lambda)\beta V_1^e]$$

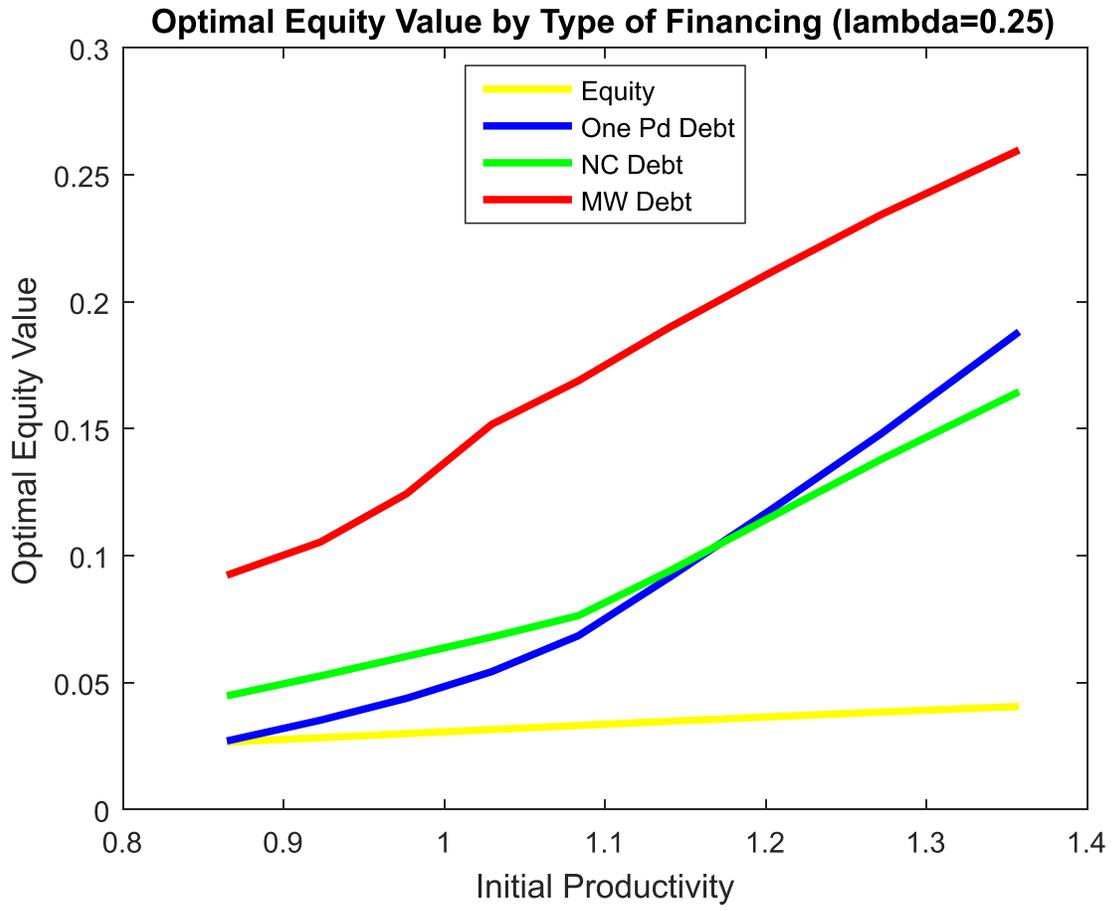
We utilize this framework to ask two major questions. First, what are the investment impacts of firms having access to make-whole debt? That is, do firms invest more when they can finance this investment with an instrument that mitigates refinancing risk? Second, how much of an impact does this additional instrument have on the overall equity value of a firm?

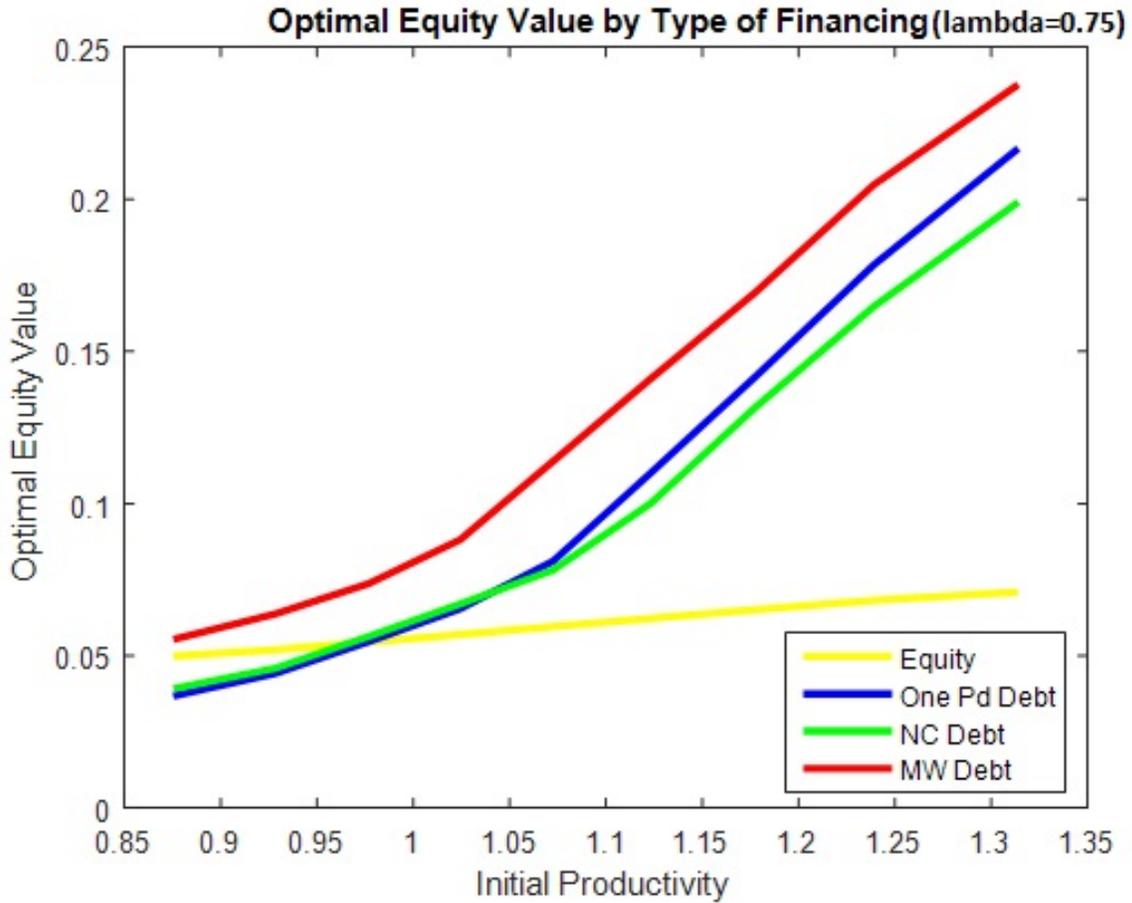
For the first question, we see that firms that issue make-whole debt often invest significantly more than those issuing other forms of financing, and that this effect is stronger for firms that face greater refinancing risk (in the form of longer project maturities.) The two figures below illustrate this effect (recall that a higher lambda means that a project is more likely to mature sooner). For both this and the following sets of plots, the results are shown for time-0 firms (and hence leverage is computed using the initial equity and desired capital levels). As this leverage increases, the refinancing risk increases and the effects are more significant than those below.





The differences in the level of investment are often stark, with firms investing 50-100% more in certain cases with make-whole debt compared to with other forms of debt. Despite the coarseness of the grids on which this model is solved, it seems that this difference is larger for firms with lower initial productivity. This again suggests that less creditworthy firms benefit more by issuing make-whole debt, consistent with the empirical evidence. We similarly see that the differences in equity values vary with the level of refinancing risk (again through the channel of lambda):





We see that the differences in equity value can also be significant. Firms issuing make-whole debt have equity values that are 4.9-11.2% higher in the high lambda case, and 27.6-51.5% higher in the low lambda (higher refinancing risk) case. Consistent with the empirical evidence, we also see that, the lower a firm's idiosyncratic productivity (and thus the higher its credit risk), the greater its benefits from issuing make-whole debt, in that these firms have higher equity values under make-whole debt relative to their equity values under both forms of non-callable debt.

6 Conclusion

This paper began by demonstrating that not all callable bonds are created equal, and that the differences among callable bonds are in fact very important. We saw that call provisions have become exceedingly popular in bonds issued by U.S. nonfinancial corporations, but that much of this recent increase came from make-whole bonds. These make-whole bonds differ from traditional callable bonds in one very important

way: their embedded call options are set at a price so low that they are virtually never in the money. This had several implications. First, we saw that previous motivations for the issuance of callable bonds based on mitigating asymmetric information and underinvestment problems by giving shareholders an option that would appreciate with the value of the bond no longer hold. Since the value of the make-whole call option does not move significantly with the value of the underlying bond, the incentives to equityholders are critically weakened. Second, the mitigation of risk shifting as an explanation of callable bonds was no longer valid either. The decrease in option value from taking on risky projects pales in comparison to the potential benefit to equityholders and again the mitigation of incentives for managers is simply not strong enough. Lastly, make-whole bonds do not allow firms to engage in interest rate risk management by construction: the price the firm pays varies with market interest rates.

Given these issues with existing explanations for the issuance of callable bonds, we sought to propose our own rationale. In order to do this, we first established three empirical facts. First, the issuance of make-whole bonds began to increase significantly around the onset of the financial crisis in the U.S. Second, the issuance of make-whole bonds was (and is) far more prevalent for lower-rated corporations than for higher-rated ones. Third, investment policies and the issuance of make-whole bonds are closely linked: firms that invest more (as a fraction of their earnings) are more likely to issue make-whole bonds, and firms that issue make-whole bonds tend to invest more of the proceeds.

These empirical facts motivated the use of refinancing risk as a mechanism for explaining the issuance of make-whole debt. In particular, firms face the risk of rolling over their debt in tight credit market conditions and as a result prefer flexibility in when they can refinance their debt, something afforded to them by make-whole bonds. We showed that this is a stronger motive for firms with higher credit risk since they are more sensitive to credit market fluctuations and for firms that invest more since their capital is more irreversible. Then we embedded this friction into a simple model and showed that make-whole debt achieves two powerful benefits. First, it expands access to credit markets for firms with lower levels of productivity, and, second, it allows almost all firms to borrow and invest more. These features help explain why make-whole bonds have become so common and why their increasing prevalence in response to increased awareness of the effects of tight credit markets makes sense from a firm's perspective.

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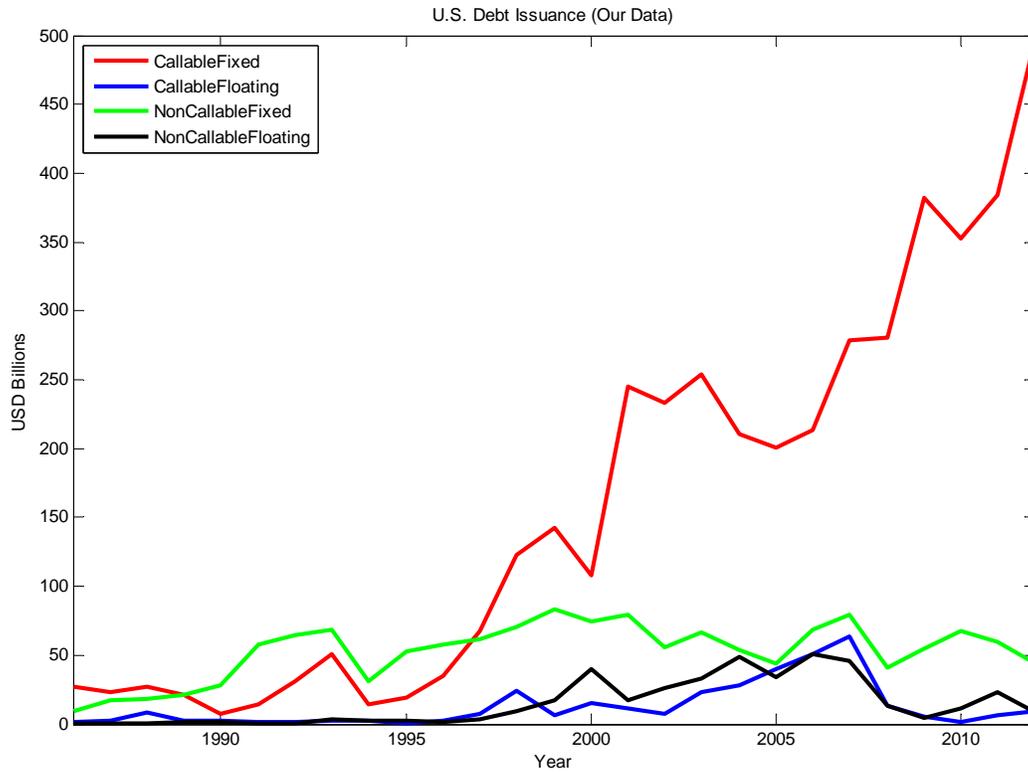
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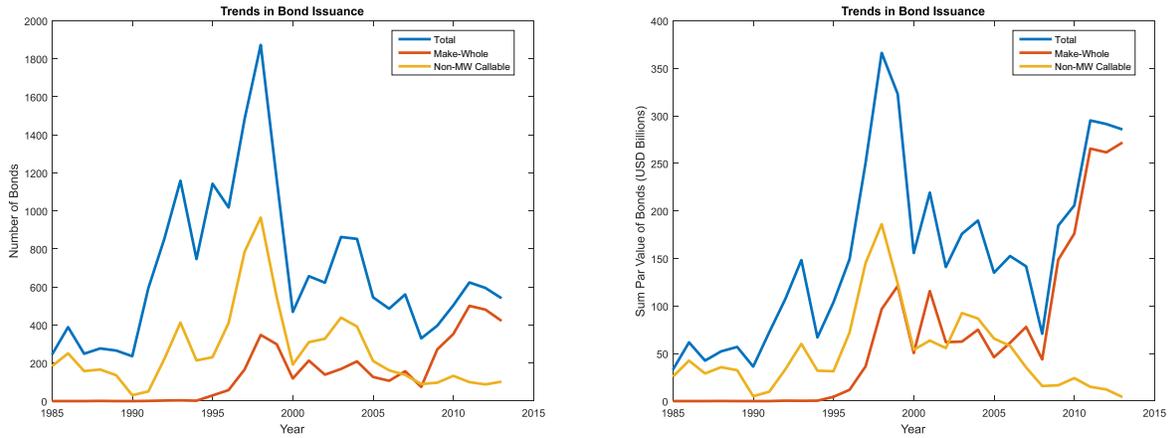
8 Appendices and Figures

Figure 1: Total Par Value of Debt Issuances by Type, 1986-2012

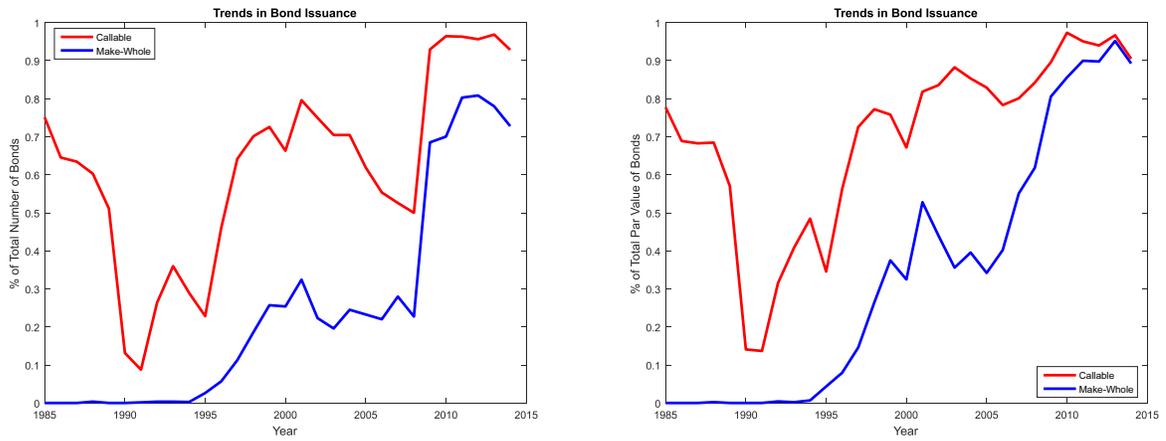


After decreasing in popularity in the early 1990s, callable bonds have become far more common and currently represent the overwhelming majority of bonds issues by U.S. nonfinancial corporations.

Figure 2: Total Debt Issuance by Type of Callable Bond, 1985-2014

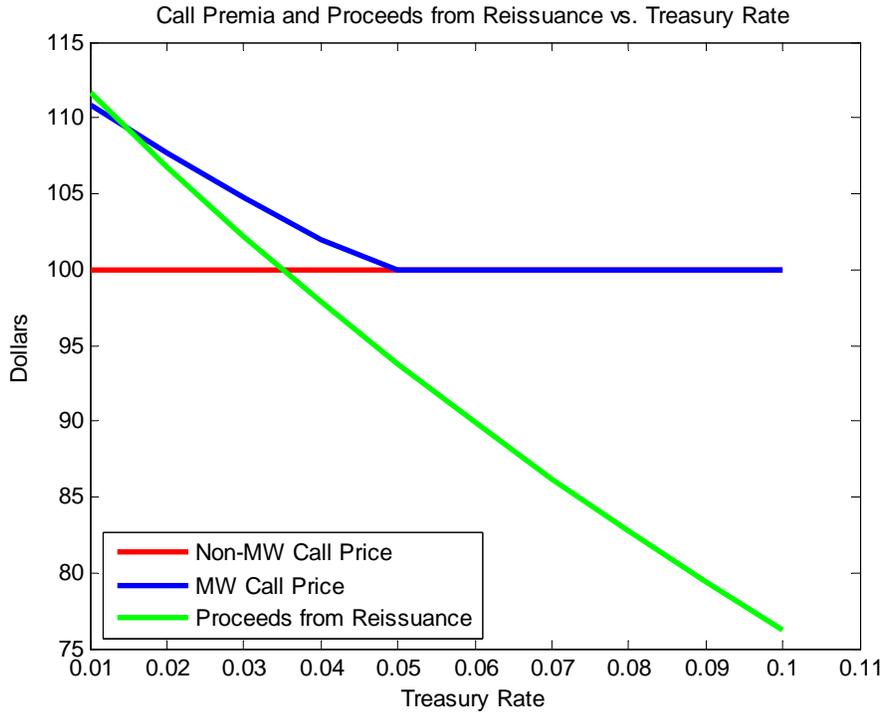


The usage of non-make-whole callable bonds decreased significantly post-1999, while the usage of make-whole bonds began to increase. The increase in the prevalence of make-whole bonds has been even more pronounced since the financial crisis in 2008.



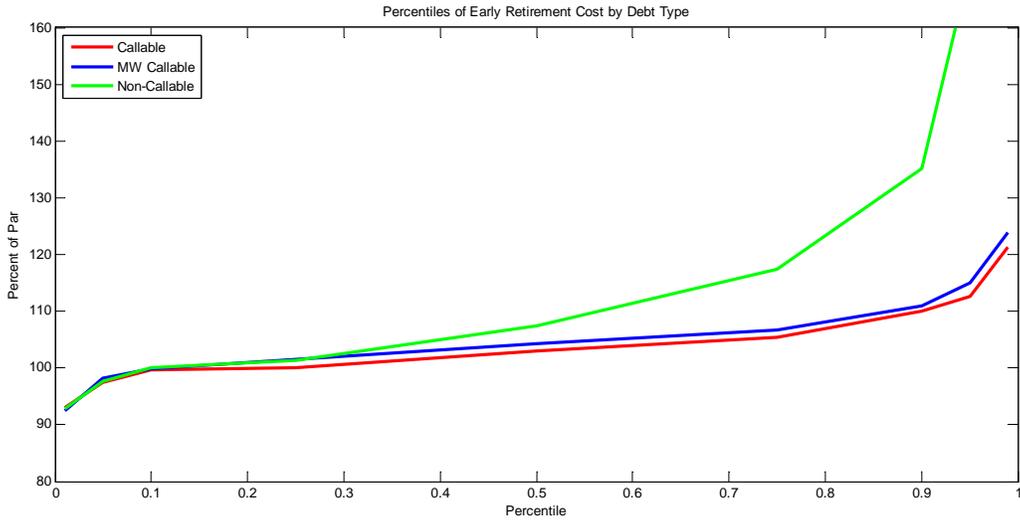
These plots show the same aggregate trends as the two above. We note that callable bonds represent over 90% of both the total number of bonds and the total par value of bonds issued in the last year (and over the last five years), with the majority of this coming from make-whole bonds.

Figure 3: An Extreme Example of Make-Whole Debt



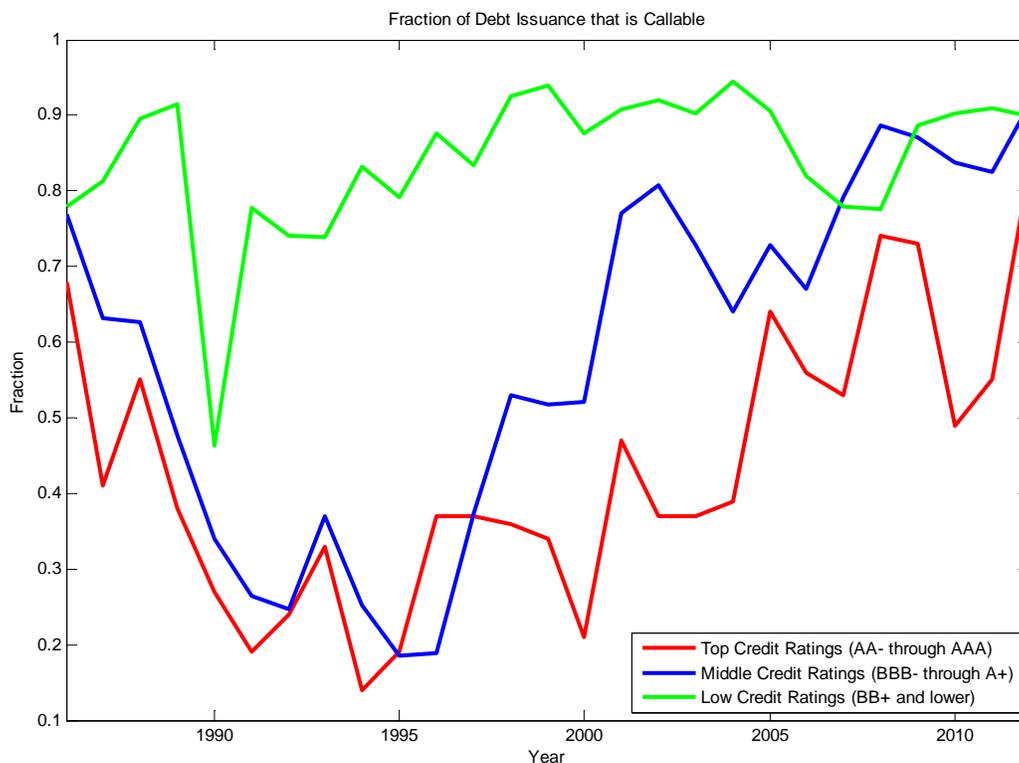
This figure replicates the example in Section 2.1 of a firm that has issued a 5-year bond at par with 5.5% annual coupon payments. The payoffs represent the proceeds/prices that the firm would have to pay after the second year of the bond, assuming a make-whole spread of 30bps. and a reissuance spread of 0bps. Note that even in the case where the firm can issue at the risk-free rate, interest rates have to be quite low for the firm to profit by calling make-whole debt and reissuing an identical bond.

Figure 4: Costs of Early Retirement by Debt Type



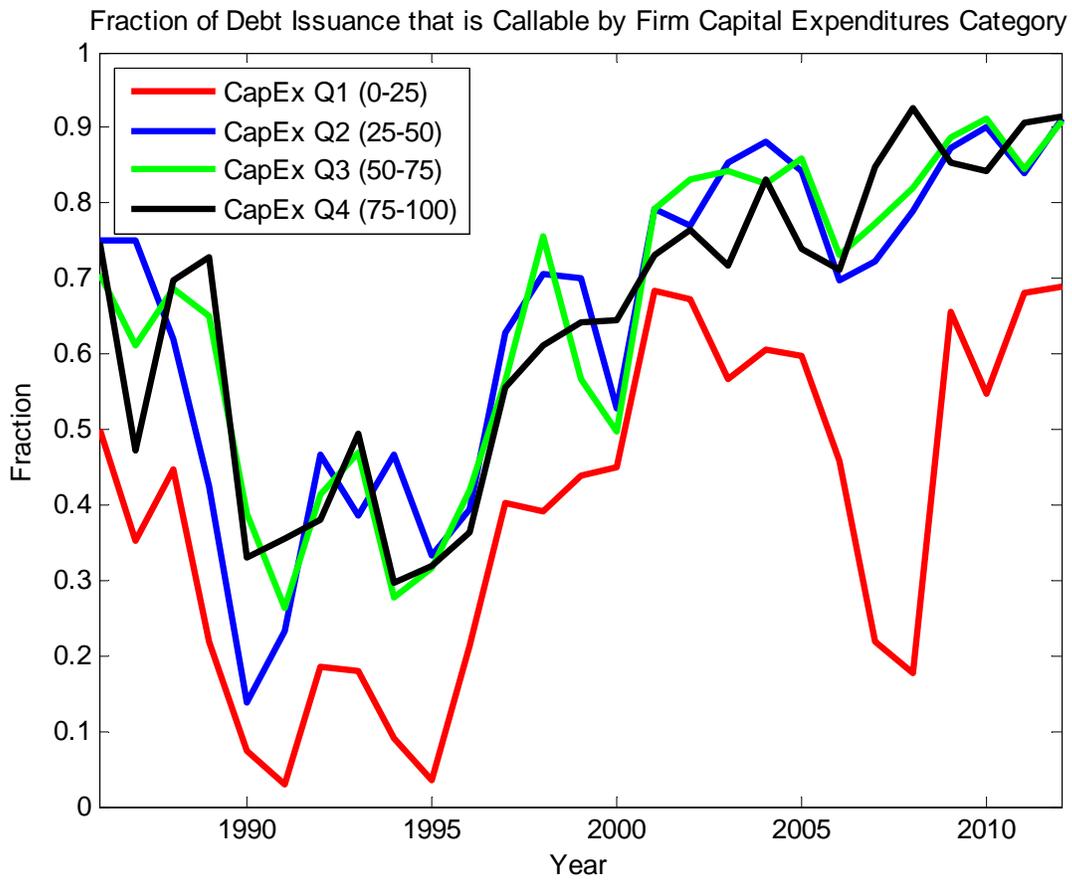
The prices paid for early retirement for non-MW callable and MW callable debt are fairly similar (MW is slightly higher) and range from 90 percent of par to 110 percent of par for over 95% of the bonds retired, while the prices paid for early retirement for non-callable bonds have a greater median (by about 5% of par) and exhibit significant positive skew, suggesting that callable and make-whole bonds offer are far less risky options for early retirement.

Figure 5: Fraction of Debt Issuance that is Callable by Firm Credit Rating, 1986-2012



Firms with lower credit ratings (more credit risk) are more likely to issue their debt as callable and were quicker to adopt callable debt. This trend is similar for make-whole callable debt and is fairly robust across different measures of credit risk (such as leverage and income volatility) and breakpoints of credit risk categories.

Figure 6: Fraction of Debt Issuance that is Callable by Firm Investment, 1986-2012



Firms with higher ratios of investment to operating income are more likely to issue their debt as callable and their use of call provisions is less sensitive to market conditions. This trend is similar for make-whole callable debt and is fairly robust across different ratios for investment. Note that it also controls for changes in the average ratios of investment to operating income since the firms are re-sorted each year.

Table 1: Uses of Issuance Proceeds

	Cash	Net PP&E	Dividends
Pre-issue level	1.3184*** (.002)	1.3159*** (.001)	0.5549*** (.006)
MW Issue	-232.565 (734.31)	1794.49*** (284.05)	-9.927** (3.295)
Year FE	Yes	Yes	Yes
Obs.	17,079	17,079	17,079
Within- R^2	0.9295	0.9869	0.1692

These fixed effects regressions are constructed by regressing the accounting variable for a firm the year after it issues a bond on the variable the year before and an indicator variable for whether the bond issue was a make-whole callable issue. Thus, the coefficients for “MW Issue” should be interpreted as the change in the relevant variable after accounting for the pre-issue level relative to all other bonds. The variables are in millions of dollars, and all variables are winsorized at 1%. Robust standard errors are clustered at the industry level.